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AUTHOR Dempsey, Richard H.; Reinsch, N. L., Jr.
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ABSTRACT

A study tested two hypotheses concerning credibility (an auditor's attitude toward a source) and arousal (attention level of an auditor): (1) the effect on learning of credibility will interact with the effect of the vigilance level of auditors, and (2) under conditions of low arousal, auditors will learn significantly more from a message if it is attributed to a higher credibility source than if it is attributed to a lower credibility source. A single, trained female student delivered the same informative message on the effects of TV violence to 144 undergraduates enrolled in eight sections of a basic university speech course. Her introduction and the prospect of a test were used to produce higher and lower levels of credibility and vigilance. Results of immediate and delayed posttests confirmed both hypotheses: the effect of credibility on learning did interact significantly with the vigilance level of the learning situation, and higher credibility produced significantly more right answers than lower credibility in the low vigilance condition but not in the high vigilance condition. In an unpredicted result, women scored higher than men, a fact perhaps explainable by uncontrolled differences in intelligence or interest. (JL)

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Arousal as a Confounding Variable:

A case study in credibility research.

Richard H. Dempsey & N.L. Reinsch, Jr. *

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* Mr. Dempsey is an Instructor and Director of Forensics at Ohio University, Athens, Ohio. Mr. Reinsch is an Assistant Professor of Communication Consultancy at Oklahoma State University, Stillwater, Oklahoma.

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Arousal as a Confounding Variable: A case study in credibility research.

The role of arousal as a primary cognitive variable has and continues to receive considerable attention in communication research.[1] Its role as a confounding methodological concern in research where it is not the primary object of focus has generally been ignored. The literature on the source credibility-learning relationship serves as a potent example of the ramifications of this ignorance. More than 15 studies have investigated the role of credibility in learning- - but the results have been inconsistent. It is suggested here that these studies represent arousal contaminated designs and that control for incidental arousal could resolve the reported anomolies and expose the methodological concerns raised above. This paper operationalizes that suggestion.

First we note that studies by Haiman,[2] Nichols,[3] Hovland and Mandell,[5] Kelman and Hovland,[6] Paulson,[7] Tompkins and Samovar,[8] King,[9] and Zagona and Harter[10] have not found that more highly credible sources were significantly more effective in producing learning. Both Haiman and Nichols, however, noted trends in the expected direction; while moderate or neutral sources were found to be more effective by Kelman and Hovland, and less effective by Zagona and Harter than either a positive or negative source. On the other hand, Wheeless[11] and Andersen[12] have reported a statistically significant relationship between credibility and learning.

Both Zagona and Harter[13] and Andersen[14] have suggested that earlier experiments may have included elements in their designs which caused subjects to pay close attention (and thus learn) any message presented to them thereby masking the retention effects which differing levels of credibility may produce. Unfortunately, both studies used only one level of attention and could not test the suggestion.

While these theoretical speculations about the role of attention remain underdeveloped and untested they suggest a base for a partial model of the credibility-learning relationship. Drawing on arousal theory, this paper develops a preliminary theoretical paradigm for the credibility-learning relationship and reports an empirical test of hypotheses generated from that paradigm. Specifically the experiment tested the effects on learning of two levels of credibility and two differing levels of subject arousal (vigilance). Both an immediate and a delayed test of learning were used.

Credibility and Learning

Previous research has indicated that people may pay more attention to, and perceive more easily, those items with which they agree.[15] Since source credibility is recognized as consisting of receiver attitudes toward a source, we would expect that high credibility (i.e. favorable attitudes toward a source) should enhance the attention paid to a source and his message.[16] Higher levels of attention should, in turn, enhance learning.[17]

Attention is here conceptualized as arousal.[18] Arousal has been shown to affect learning in several ways. A general state of high arousal which precedes, or is concurrent with, the presentation of a stimulus seems to improve learning of the stimulus (except that extreme excitation may produce cognitive impairment).[19] High arousal which follows the presentation of a stimulus may impair performance on an immediate test of learning and improve performance on a delayed test.[20] It appears that there are probably several types of arousal (for example, vigilance or generalized arousal and selective attention or focused arousal) and that each type of arousal may be produced by any of several situational factors.[21] Further, we would suggest that while arousal is potentially heightened through each of several channels, the effects are not usually additive. The human organism protects itself from overstimulation by responding to the one

arousal stimulus which is perceived as most relevant. In practice this means that when several situational factors encourage different levels of heightened arousal only one, typically the one producing the highest level, will have a measurable effect on learning.

This implies that credibility inductions will not affect learning if presented in the presence of a stronger arousal stimulus. The competing stimulus might either encourage selective attention on specific factors[22] or heighten general vigilance.[23] This explains, we believe, why many previous studies have failed to support a positive relationship between credibility and learning; these studies have scheduled special experimental meetings, told subjects they would be tested, and brought in guest speakers, tape recorders, or special written messages. Any of these factors might either raise the level of general vigilance, or selectively focus attention on the messages and obscure the effects or perceived credibility. Since the effects of arousal have sometimes been observed to interact with the time of posttest it is also noteworthy that many of the studies used only an immediate posttest. A preferable procedure would be to administer both an immediate and a delayed test.

In other words, auditors generally learn more from a message if they are in a state of moderately high arousal (vigilance) than if they are in a state of lower arousal (vigilance). If, auditors are in a lower state of arousal then the attachment of positive attitudes (high credibility) to a message source should increase auditor's learning of that source's message. But if auditor's are already in a state of moderately high arousal so that they are monitoring all potentially useful messages carefully then the effects of source directed attitudes (credibility) will not be observable.

This analysis suggested the following hypotheses:

1. The effect on learning of credibility will interact with the effect of the vigilance level of the auditors.

2. Under conditions of low arousal auditors will learn significantly more from a message if it is attributed to a higher credibility source than if it is attributed to a lower credibility source.

Method

Subjects were 144 undergraduates, 66 males and 78 females, enrolled in eight sections of the basic speech course at University. The sections were used as intact groups as they met for class. One section was assigned to each of eight experimental conditions. In several ways the procedures replicated the study by Andersen.[24]

The message was the same as used by Andersen. It dealt with the effects of television violence on children and was designed to be informative rather than persuasive. All presentations of the experimental message were made by the same female student speaker. Several procedures were used to control delivery. First the speaker was not informed of the purpose of the experiment or the experimental manipulations. Second, the training of the speaker was designed to emphasize consistency of delivery at the expense of rhetorical excellence, e.g. gestures, physical movement, and vocal variation were reduced to a minimum. Finally, the class instructor and a student confederate rated the delivery of each presentation so that a seriously altered presentation could have been discarded.

The independent variables in this study were credibility of the source (higher and lower), vigilance level of the classroom environment (higher and lower), subject sex (each subject reported their sex and subject sex was treated as an independent variable), and the time at which the posttest instruments were administered (immediate or delayed). The two posttests (immediate and delayed) were used since, as noted previously, the effects of arousal have sometimes interacted with time of testing. Subject sex was noted in order to control for possible interactions between source sex (female) and receiver sex. The dependent variable

was retention as measured on a multiple-choice test.

Perceived source credibility was manipulated by the presentation of introductions designed to create different levels of perceived competence, the one dimension previously linked to learning.[25] Student responses to a questionnaire were used to construct two introductions. The lower credibility introduction described the speaker as a P.E. major who had worked as a waitress and who had been required to give a speech on some aspect of mass communication. The higher credibility introduction described the speaker as a psychology major, sociology minor, who had worked as a children's counselor, had done original research on the effects of T. V. violence, and who had been hired by a metropolitan T. V. station to work in their programming department. A pilot study using McCroskey's[26] peer scales found that the higher credibility source was perceived as significantly more competent than the lower credibility source ($\bar{X}$s = 23.65; 20.64; n = 31, 34; t = 2.98; $p < .05$). A posttest of credibility during the experimental sessions provided further evidence of a successful induction. A four-way Analysis of Variance[27] revealed a significant main effect for the higher credibility induction over the lower credibility induction ($\bar{X}$s = 24.16, 20.75; F = 33.89; d.f. = 1/127; $p < .05$). So, while both sources were perceived as being moderately competent, the higher credibility source was perceived as more competent.

The low vigilance environment was operationalized by having the source deliver the message to subjects during a period in which other students were delivering speeches. At the beginning of the class period the source and a student confederate were introduced by the instructor as students making up incompletes from the previous quarter. The experimental message was presented second in a group of student speeches scheduled for that period. Immediately prior to the presentation of the experimental message the confederate presented an introduction for the experimental source designed to induce either higher

or lower credibility.

The high vigilance environment was operationalized by using the above procedures with the addition of a statement by the instructor (in his or her initial introduction) that the students were to be tested over the content of messages presented during the class period and that the test would be scored. In this condition the experimental message was the first speech presented.

The posttest questionnaire was introduced as an effort by the Communication Department to determine if students learn from speeches presented in the basic speech course. The first section of the posttest questionnaire consisted of semantic differential scales developed by McCroskey[28] to measure credibility for peers. The second section was a retention test over the content of the experimental message consisting of twenty multiple-choice questions developed by Andersen[29] and found by him to have an internal reliability of .64. In the immediate test condition subjects were given the questionnaire at the end of the experimental message. In the delayed test condition the subjects were given the questionnaire at the end of the class period after other student speeches. Subjects were debriefed by either the experimenter or their instructor.

Results and Discussion

Responses were collected from 144 subjects. Responses from three subjects were incomplete; these subjects were included in the analysis as their scores permitted. The twenty-item learning test was scored by the Vohs[30] technique which catalogs answers as right, wrong, or omitted. In this system the subject omits answers when he believes he lacks the data necessary to answer the question. Omissions are believed to represent a failure to adequately attend to a message, thus the system provides an empirical measure of subject attention. Each subject's retention score and his omission score had a potential range of zero to twenty.

Omitted answers were analyzed first. A four-way Analysis of Variance of the number of omitted answers showed two significant effects. As shown in Table 1 a significant main effect was observed for vigilance, with more answers being omitted under low vigilance conditions ($\bar{X}$ = 4.02) than under high vigilance ($\bar{X}$ = 2.52). If, as suggested by Vohs, omissions indicate lack of information due to lower levels of attention then this result is evidence that we successfully induced two differing levels of vigilance.

A significant sex by time interaction was also observed. Further analysis using multiple t-tests[31] indicated that this was because women omitted significantly more answers under immediate ($\bar{X}$ = 3.74) test conditions than under delayed ($\bar{X}$ = 2.20) test conditions (t = 2.67, $p < .05$). This may result from the women in our sample being more susceptible to test anxiety than the men; that is, delaying the test may have increased anxiety to a point where the women were reluctant to leave answers blank and were more inclined to guess. Our data do not permit us to evaluate the accuracy of this notion. But, whether or not our analysis is correct on this point, our data do suggest that the number of omitted answers may not be a simple indication of attention level alone. A sex by time interaction does not seem to us compatible with such an interpretation of omissions.

The number of right answers, the primary dependent variable, was also analyzed with a four-way Analysis of Variance. As shown in Table 2 there were three significant effects. The highest order effect was a credibility by vigilance interaction. This result supported hypothesis one. The effect of credibility on learning did interact significantly with the vigilance level of the learning situation. This is consistent with our notion that the effects of vigilance on learning and the effects of credibility on learning are not simply additive. This result also provides support for the analysis that previous experimenters may have permitted high arousal to obscure credibility

effects.

Multiple t-tests revealed that higher credibility produced significantly more right answers than lower credibility in the low vigilance condition ($\bar{X}$s = 11.50, 9.86, t = 2.314, d.f. = 127, $p < .05$), but not in the high vigilance condition ($\bar{X}$s = 12.21, 12.61, t = 0.252). These results provided support for hypothesis two. In a low vigilance environment auditors learned significantly more from a message when it was attributed to a higher credibility source than when it was attributed to a lower credibility source. This indicates that the credibility of teachers and other sources of information may sometimes be a significant determinant of the retention of their messages.

Our results do not permit us to conclude that credibility has an effect only in low vigilance environments. They do indicate that, using current measures of learning, the effects will be observable only when the arousal generated by credibility is more potent than arousal generated by other contextual elements. Different or more sophisticated measurements of learning might reveal observable effects even in the presence of higher vigilance levels.

Table 2 also shows significant main effects for vigilance and sex; high vigilance produced more correct answers than did low vigilance ($\bar{X}$s = 12.46, 11.39), and women scored more right answers than men ($\bar{X}$s = 12.95, 11.39).

The effect of vigilance on learning is consistent with the expectation, expressed as part of the theoretic rationale, that learning is strongly influenced by the auditor's level of attention or arousal. Since retention of at least a portion of a message seems a requirement for all human communication, the potency of arousal as an influence on cognitive processes is a significant finding. More studies might be conducted to determine if current educational strategies and techniques are making the best use of this powerful influence. It would appear that even sources having lower credibility may be able to produce high levels of learning by judicious vigilance arousal.

The finding that women scored higher than men was not predicted. At least two possible explanations are available. First, since grade point average and intellect were not controlled, the women were perhaps more intelligent than the men in the sample. Another possibility is that since the message dealt with an influence on child development, women were more interested than men. Our data do not permit a decision regarding the accuracy of either possible explanation.

This investigation was an attempt to explain the inconsistency of the results of prior studies.[32] It was suggested that in a message receiving situation there may be several factors which could potentially determine the auditor's level of arousal. Attitudes toward the source (credibility) were identified as one such factor. It was further argued that such factors are not simply additive but rather that the factor or factors which call for the highest level of arousal may mask the effects of a factor of factors which call for a lower level of arousal. This conceptualization should be viewed as a tentative and initial explanation of part of the arousal-learning mechanism. But such a conceptualization does permit an explanation of the failure of prior studies to find a consistent positive impact of crediblity on learning. And such a conceptualization did, in this investigation, yield predictions which were confirmed by empirical test. Of greater potential significance, we believe we have identified certain aspects of the confounding role arousal may play in communication research. Clearly, future researchers should consider design implications which may trigger arousal effects and thus obscure certain types of relationships which were the primary concern of the study.

Footnotes

[1] See for example, Joseph N. Cappella and John O. Greene, "Discrepancy-arousal Explanation of Mutual Influence in Expressive Behavior for Adults and Infant-Adult Interaction," Communication Monographs, 49 (1982), 89-114.

[2] Franklyn S. Haiman, "An Experiment in Informative Speaking", Quarterly Journal of Speech, 34 (1948), 355-360.

[3] Ralph G. Nichols, "Factors in Listening Comprehension." Speech Monographs, 15 (1948), 154-163.

[4] Carl I. Hovland and Walter Weiss, "The Influence of Source Credibility on Communication Effectiveness," Public Opinion Quarterly, 15 (1951), 635-650.

[5] Caril I. Hovland and Wallace Mandell, "An Experimental Comparison of Conclusion Drawing by the Communicator and the Audience," Journal of Abnormal and Social Psychology, 47 (1952), 581-588.

[6] Herbert Kelman and Carl I. Hovland, "Reinstatement of Communicator in Delayed Measurement of Opinion Change," Journal of Abnormal and Social Psychology, 48 (1952), 327-335.

[7] Sta-ley F. Paulson, "The Effects of the Prestige of the Speaker and Acknowledgment of Opposing Arguments on Audience Retention and Shift of Opinion," Speech Monographs, 21 (1954), 267-271.

[8] Phippil K. Tomkins and Larry A. Samovar, "An Experimental Study of the Effects of Credibility on the Comprehension of Content," Speech Monographs, 31 (1964),120-123.

[9]Thomas R. King, "An Experimental Study of the Effect of Ethos upon the Immediate and Delayed Recall of Information," Central States Speech Journal, 17 (1966), 22-28.

[10]Salvatore V. Zagona and Russell M. Harter, "Credibility of Source and Recipient's Attitude: Factors in Perception and Retention of Information on Smoking Behavior," Perceptual and Motor Skills, 23(1966), 155-168.

[11]Lawrence R. Wheeless, "The Effects of Comprehension Loss on Persuasion," Speech Monographs, 38 (1971), 327-330; and "The Relationship of Course Attitudes, Instructor Credibility, Attraction, and Homophily to Immediate Recall and Student-Instructor Interaction" (Paper presented at the Speech Communication Association Convention, November, 1973).

[12]Peter Andersen, "Credibility and Learning" (M.A. thesis, Illinois State University, 1972).

[13]Zagona and Harter, pp. 159-160.

[14]Andersen, p. 5.

[15]Donald R. Broadbent, Perception and Communication (London: Pergamon, 1958), p. 120; V. O. Key, Jr., "Media: Spector and Reality," in Speech Communication: Analysis and Readings, eds. Howard H. Martin and Kenneth E. Andersen (Boston: Allyn and Bacon, Inc., 1968), p. 116; Leo Postman, Jerome S. Bruner, and Elliot McGinnies, "Personal Values as Selective Factors in Perception," Journal of Abnormal and Social Psychology, 43 (1948), 142-154; and Magdalen D. Vernon, "Perception, Attention, and Consciousness," Advancement of Science, 1960, 111-123.

[16]James C. McCroskey, An Introduction to Rhetorical Communication (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1968), p. 65.

[17]See for example, Joseph A. Cobb, "Relationship of Discrete Classroom Behaviors to Fourth-Grade Academic Achievement," Journal of Educational Psychology, 63 (1972), 74-80; Bryce B. Hudgins, "Attending and Thinking in the Classroom," Psychology in the Schools, 4 (1967), 211-216; Henriette M. LaHaderne, "Attitudinal and Intellectual Correlates of Attention: A Study of Four Sixth-Grade Classrooms," Journal of Educational Psychology, 59 (1968), 320-324; and S. Jay Samuels and James E. Turnure, "Attention and Reading Achievement in First Grade Boys and Girls," Journal of Educational Psychology, 66 (1974), 29-32.

[18]For an introduction to the literature see John F. Hall, Verbal Learning and Retention (Philadelphia: J. B. Lippincott Company, 1971), pp. 211-221.

[19]See R. N. Berry, "Skin Conductance Levels and Verbal Recall," Journal of Experimental Psychology, 63 (1962), 275-277; Godwin C. Chu, "Fear Arousal, Efficacy, and Imminency," Journal of Personality and Social Psychology, 4 (1966), 517-524; and Irving Maltzman, William Kantor, and Barry Landon, "Immediate and Delayed Recall, Arousal, and the Orienting and Defensive Relexes," Psychonomic Sciences, 6 (1966), 445-446.

[20]See Lewis J. Kleinsmith and Stephen Kaplan, "Paired-Associate Learning as a Function of Arousal and Interpolated Interval," Journal of Experimental Psychology, 65 (1963), 190-193; Lewis J. Kleinsmith and Stephen Kaplan, "Interaction of Arousal and Recall Interval in Nonsense Syllable Paired-Associate Learning," Journal of Experimental Psychology, 67 (1964), 124-126; and Edward L. Walker and Robert D. Tarte, "Memory Storage as a Function of Arousal and

Time with Homogeneous and Heterogeneous Lists," Journal of Verbal Learning and Verbal Behavior, 2 (1963), 113-119.

[21]See Stephen Kaplan and Rachel Kaplan, "Arousal and Memory: A Comment," Psychonomic Science, 10 (1968), 290-291.

[22]Andrew McGhie, Pathology of Attention (Baltimore: Penguin Books, 1969), p.19; and Donald A. Norman, "Toward a Theory of Memory and Attention," Psychological Review, 75 (1968), 522-536.

[23]J. Anthony Deutsch and D. Deutsch, "Attention: Some Theoretical Considerations," in Foundations of Communication Theory, eds. Kenneth K. Sereno and C. David Mortensen (New York: Harper and Row, 1970), pp. 152-165.

[24]Andersen.

[25]Andersen; and Wheeless, 1971, 1973.

[26]James C. McCroskey, "Scales for the Measurement of Peer Credibility," Unpublished monograph, Communication Research Center, Illinois State University, 1972.

[27]All the Analysis of Variance tests were performed using a local program, ANALVAR, at the University Computer Center.

[28]McCroskey, "Peer Credibility."

[29]Andersen, pp. 45-48.

[30]John L. Vohs, "An Empirical Approach to the Concept of Attention," Speech Monographs, 31 (1964), 355-360.

[31]Roger E. Kirk, Experimental Design: Procedures for the Behavioral Sciences (Belmont, CA: Brooks/Cole Publishing Company, 1968), pp. 73-74.

[32]Velma J. Lashbrook, "Source Credibility: A Summary of Experimental Research," (Paper presented at the Speech Communication Association Convention, December, 1971), p. 1.

Table 1

Analysis of Variance: Omitted Answers

Cell	Condition				$\bar{X}$	n
	Sex	Credibility	Vigilance	Time		
1	Male	Lower	Lower	Immediate	5.60	5
2	M	L	L	Delayed	4.70	10
3	M	L	Higher	I	1.73	15
4	M	L	H	D	3.10	10
5	M	Higher	L	I	4.33	6
6	M	H	L	D	3.13	8
7	M	H	H	I	0.05	6
8	M	H	H	D	2.33	6
9	Female	L	L	I	4.87	15
10	F	L	L	D	2.60	5
11	F	L	H	I	2.73	15
12	F	L	H	D	1.33	6
13	F	H	L	I	4.43	7
14	F	H	L	D	2.62	13
15	F	H	H	I	3.30	10
16	F	H	H	D	1.83	6

Source of Variance	SS	df	MS	F
Between				
Sex (A)	1.41	1	1.41	<1
Credibility (B)	8.48	1	8.48	1.242
Vigilance (C)	114.16	1	114.16	16.719*
Time (D)	16.49	1	16.49	2.416
AB	14.47	1	14.47	2.119
AC	10.99	1	10.99	1.609
AD	31.09	1	31.09	4.553*
BC	2.60	1	2.60	<1
BD	0.14	1	0.14	<1
CD	20.45	1	20.45	2.995
ABC	0.15	1	0.15	<1
ABD	-0.03	1	-0.03	<1
ACD	8.02	1	8.02	1.175
BCD	-0.01	1	-0.01	<1
ABCD	0.81	1	0.81	<1
Within	867.12	127	6.83	

* $p < .05$

Table 2

Analysis of Variance: Right Answers

Cell	Condition				$\bar{X}$	n
	Sex	Credibility	Vigilance	Time		
1	Male	Low	Low	Immediate	10.00	5
2	M	L	L	Delayed	9.00	10
3	M	L	High	I	12.53	15
4	M	L	H	D	10.70	10
5	M	High	L	I	10.85	6
6	M	H	L	D	10.25	8
7	M	H	H	I	11.00	6
8	M	H	H	D	10.50	6
9	Female	L	L	I	10.80	15
10	F	L	L	D	8.60	5
11	F	L	H	I	13.47	15
12	F	L	H	D	13.83	6
13	F	H	L	I	10.71	7
14	F	H	L	D	13.00	14
15	F	H	H	I	13.50	10
16	F	H	H	D	13.00	6

Source of Variance	SS	df	MS	F
Between				
Sex (A)	70.47	1	70.47	9.946*
Credibility (B)	7.22	1	7.22	1.019
Vigilance (C)	113.20	1	113.20	15.978*
Time (D)	7.61	1	7.61	1.074
AB	4.78	1	4.78	<1
AC	17.50	1	17.50	2.471
AD	7.16	1	7.16	1.010
BC	38.35	1	38.35	5.412*
BD	13.83	1	13.83	1.953
CD	0.42	1	0.42	<1
ABC	0.81	1	0.81	<1
ABD	1.71	1	1.71	<1
ACD	0.12	1	0.12	<1
BCD	9.50	1	9.50	1.341
ABCD	18.92	1	18.92	2.670
Within	899.81	127	7.09	

* $p < .05$